cultures primary mycelia were obtained which did not produce carpophores. When parts of each mycelium were mixed in a culture, a secondary mycelium appeared and fruit bodies were produced. The chief method of bringing about the plasmogamy is through the union of a hyphal cell of one thallus with an oidium from another thallus. Miss BENSAUDE concludes that the "dicaryon" in *C. fimetarius* is formed following plasmogamy between cells coming from 2 different thalli.

The transformation of a primary mycelium into a secondary mycelium is very difficult to observe. This is brought about by the anastomosis of 2 hyphal cells of different thalli in *C. fimetarius*. The fusion of 2 such cells (plasmogamy or pseudogamy) introduces the cytoplasm and nucleus or nuclei of one cell into the other, which results in the establishment of a binucleate cell. If 2 cells unite which have more than 2 nuclei in common, all disintegrate but 2. The uninucleate oidium may fuse with a hyphal cell, and this is a very common means of bringing about the initial binucleate condition of the cell.

Each cell in these secondary hyphae is binucleate, constituting a "dicaryon." Conjugate nuclear division occurs in these hyphae as a rule in the apical cell, although intercalary cells divide occasionally. At the time of division the 2 nuclei move to the middle of the cell, and the actual process of cell division is preceded by the formation of a protuberance which is to form a clamp. One of the nuclei, which Miss BENSAUDE calls (+), on the basis of her results with single spore cultures, enters this very short branch, and the (−) nucleus remains at about the same level in the mother cell. Spindles are formed and conjugate nuclear division takes place. One of the (+) daughter nuclei goes back into the mother cell, and the other goes to the apex of the young clamp. A cross-wall cuts off the beak cell from the mother cell. Of the 2 (−) daughter nuclei, one goes to the apical part of the mother cell and the other to the basal part, and a cross-wall is formed at the level of the young clamp, dividing the cell into an apical portion with (+) and (−) daughter nuclei and a basal cell with only the (−) daughter nucleus. The little beak now fuses with the basal cell, and its nucleus passes into this cell, so that it also becomes binucleate. Very often the apex of the beak fuses with the mother cell before nuclear division takes place.

Reversion of secondary to primary mycelium occurs, in which case a uninucleate cell appears among binucleate cells. No clamps are found on the cross-walls of this cell, and these uninucleate cells may bear oidia.—MICHAEL LEVINE.

A new conception of sex.—JONES[4] presents a conception of sex which is quite unorthodox, but at least it furnishes considerable food for thought. This author sees in fertilization an "attack" of a "parasitic" male gamete

[4] JONES, W. N., On the nature of fertilization and sex. New Phytol. **17**:167–188. 1918.

upon a female gamete well stocked with food reserves, the stimulus of fertilization being similar to that induced in gall formation. The first sperm "vaccinates" the egg and renders it immune to other sperms. Many further analogies are drawn between sex and parasitism or symbiosis. More interesting is his distinction in higher forms between "sex" and "gender." Sex is purely sporophytic, determined in Mendelian manner by chromosome equipment; "male" signifies "microspore-producing," "female" signifies "megaspore-producing." "Gender" is gametophytic and is lodged in the cytoplasm; the nature of the cytoplasm may show gradations between the two extremes of "androplasmic" (or sperm-producing) and "gynoplasmic" (or egg-producing). Thus in a homosporous pteridophyte the spore is still diploid with reference to gender, which is differentiated later. Gradually the androplasm begins to dominate in some cells, gynoplasm in others, until at last the cells are sufficiently unlike to fuse again. Which kind dominates in a particular region may be tied up with nutrition. In heterosporous forms "the archesporial tissue of the anthers is predestined normally (chromosomes) to develop into microspores, an environment which favors the dominance of androplasmic protoplasm." To explain hermaphroditic spermatophytes the author states that "the production of anthers or ovaries is a sex or somatic (Mendelian) characteristic, which may show somatic segregation like other somatic characters." Carrying these ideas over to man, an effeminate man would be produced from an x zygote in which gynoplasm dominated, a masculine woman from a $2x$ zygote in which androplasm dominated. The author believes that many of the characteristics popularly associated with one sex only are in reality the common property of both sexes, although in one they may perhaps be limited in their expression.—Merle C. Coulter.

Mineral absorption in spinach.—In attempting to demonstrate a causal relation between spinach blight and universal malnutrition, True and his colleagues[5] subjected spinach to very heavy applications of various fertilizers, both singly and in mixtures. As high as 1500 lbs. per acre of NaCl, $NaNO_3$, and Na_2SO_4, 6 tons of $CaCO_3$, 2 tons of $MgCO_3$, 2000 lbs. of acid phosphate, 4000 lbs. of complete fertilizer, and 40 tons of manure were used. Although failing to throw any light on the origin of the blight, the results contribute to our knowledge of mineral absorption by plants. The total ash, and each of its constituents with the exception of manganous oxide, was always greater in amount in the leaves than in the tops. The ash elements fall naturally into two groups: (1) those that are present in quantities that show relatively little variation whatever be the chemicals added to the soil (CaO, MgO, P_2O_5, SO_3, MnO, Al_2O_3, and Fe_2O_3); and (2) those which show great fluctuations in the quantity present (SiO_2, K_2O, and Na_2O). The elements of the first group

[5] True, R. H., Black, O. F., and Kelly, J. W., Ash absorption by spinach from concentrated soil solutions. Jour. Agric. Res. 16:15–25. 1919.